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ABSTRACT

The development of scripts and their use for guiding memory was examined in children ages 3 to 5 and 7 to 9. In the first phase of the study, 10 preschool children and 10 elementary school students were asked to describe three scripts related to everyday life. Scripts were analyzed to determine whether any differences existed between those of younger and older children. It was found that older children generated longer scripts and that there was little overlap in script items across age groups. In the second phase, "typicality ratings" for script items were obtained. Ten new subjects from each age group were trained to use a four-point scale, on which typicality of script items was expressed in terms of frequency of occurrence. The fact that most items were rated similarly by both age groups is strong evidence that differences exhibited in the first phase were due to verbal ability rather than to the structure of the scripts themselves. The third phase investigated how information considered atypical or irrelevant to the script was remembered. Test stories were constructed using the typicality rating information from the second phase; results indicated that, while children of both age groups were poor at discriminating typical items, elementary school children showed dramatically better rejection of atypical distractors than did preschoolers. (RH)

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Script Development and Memory Organization

Lea T. Adams & Patricia E. Worden

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Our study examined the development of scripts and their use for guiding memory in 3 to 5 and 7 to 9 year olds. A script is a structure that describes appropriate sequences of events in stylized everyday situations. We wondered what might change about children's scripts as they grow older and become more experienced.

In phase one of our study, preschoolers and elementary children were asked to describe three everyday scripts. In phase two, typicality ratings were obtained for these scripts. In the third phase test stories were constructed using the typicality rating information from phase two. The stories included both typical and atypical information. Recognition memory for these two types of information was assessed using signal-detection methodology.

Our first major purpose was to determine whether any differences exist between the scripts of preschoolers and elementary children. Nelson (1978) has shown that children as young as 2 1/2 years already have well-formed and available scripts. Moreover, both Nelson (1978), and Schank and Abelson (1977) have shown that as children become older more aspects of the generic script are stated in their protocols. Exposure to more situations and repeated interactions in the real world undoubtedly contribute to this (Nelsen, 1978; Schank & Abelson, 1977), but an increase in verbal proficiency could also account for the more elaborate scripts generated by older children. Thus, the possibility exists that very young children's scripts may be more

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fully developed than their verbal ability allows them to communicate.

The first purpose of the present study, then, was to determine if any differences do exist between the scripts generated by children just old enough to verbalize understandably (3-5 year olds) and children whose verbal ability and experience are well developed (7-9 year olds). Ten children from each age group were asked to describe getting up in the morning, going to the grocery store, and going to a restaurant. The three scripts were counterbalanced for order of presentation and the children went through the task twice to encourage generation of as much information as possible.

We found that the ten older children generated longer scripts, 142 items vs. 112 for the ten young children. Interestingly, an amazing variability existed, as only about 25% of the items were generated by more than 1 child! Moreover, only 16% of the items mentioned by more than one child were given by both preschoolers and elementary children. Thus, the generation task suggested that the scripts of older children were not only longer, but also were qualitatively different, as there was surprisingly little overlap in the items generated by two or more children when the two age groups were compared.

However, results from the typicality rating task suggested a different picture. All items generated by two or more subjects from either age group were assembled. We then created additional items that might have been considered atypical, but not bizarre or outlandish. Tying your shoe in a grocery store is an example of one such experimenter-generated atypical item. Ten new subjects from each age group were trained to use a four-point scale, where typicality was

expressed in terms of frequency of occurrence. Subjects were presented with script items (e.g., brushing your teeth when getting up in the morning) and they pointed to frowning, neutral, and smiling faces indicating "That never happens," "That happens once in a while but not never," "That happens a lot but not always," and "That always happens."

Our first analysis looked for age-specific items. For each item we obtained the difference between the mean typicality rating for each age group. Those items differing from the mean difference score by more than one standard deviation were classified as age-specific items. Surprisingly, the typicality ratings of both age groups were so similar that only 16 of the items could be classified as age-specific! Thus, although young and older children generated highly different sets of script items in phase one, their ratings of script items were highly similar in phase two. The fact that most of the items were rated similarly by both age groups is strong evidence that phase one differences were due to verbal ability differences in the generation process rather than to differences in the underlying scripts themselves. Others, such as Nelson (1978), and Shank and Abelson (1977) have come to similar conclusions.

Phase three addressed an issue recently debated by script theorists, namely, how information considered atypical or irrelevant to the script is remembered. Some researchers have claimed that atypical information is not remembered as well as typical information (e.g., Bransford, 1979; Kintsch & van Dijk, 1978). However, the fact that subjects often guess about typical information is not usually taken into consideration. Shank and Abelson (1977), and more

recently, Graesser (1981) have pointed out that while it is true that more typical information is correctly remembered, it is also true that people tend to remember a lot of typical information that was not experienced. Signal detection methodology takes such guessing into account. Graesser has found that adults could not discriminate typical items that had been presented (hits) from those that had not (false alarms). In contrast, discrimination of atypical items was excellent. It is theorized that exposure to the typical items merely activates a "pointer" to the relevant generic script in memory, whereas the atypical items are "tagged" onto the script for purposes of that particular memory task. Since all generic script items (that is, all the typical ones) are activated, discrimination of individual typical items is poor. Atypical items, on the other hand, are uniquely tagged, and thus are readily discriminable.

In order to prepare the stimulus stories used in the recognition task, those items from the typicality rating task that were lower than one standard deviation from the mean were considered atypical items. Typical and atypical items were rank ordered and two stories were constructed using matched items. Your handout gives the first portion of each story. Stories A and B were identical in length and structure, and both described a character (Jack or Jane, depending on the sex of the subject) participating in the three scripted activities. Each version contained 22 typical items, 11 atypical items, and 8 age-specific items. The purpose of having two complementary versions of the story was so that in the recognition task the script elements in one version could serve as a set of distractors for the other story.

Twenty new subjects from each age group listened to either Story A or Story B, and then performed a 10 minute intervening task. A Yes/No recognition test containing all 82 items from both story versions was then administered to the subjects. The bottom of your handout presents the results of the signal detection analysis. The d' scores varied significantly as a function of age ($F(1,38) = 16.60$), and typicality ($F(1,38) = 138.51$). The typicality main effect confirms the prediction that recognition accuracy of typical items should be poor ($M d' = .52$), whereas atypical items should be discriminated significantly better ($M d' = 1.80$). Most important was the significant age x typicality interaction ($F(1,38) = 25.74$, $p < .01$). Simple main effects analysis showed that d' did not vary according to age group for typical items--it hovered in the .50 range--($F(1,38) = 1.33$, $p > .05$), but that recognition of atypical items was significantly better for older subjects, whose mean d' was 2.56, than for younger children, whose mean d' was 1.05 ($F(1,38) = 23.43$, $p < .01$).

Hit rates showed much less variability than did false alarm rates. That hit rates were highly similar in the various conditions, and were all above 80% suggests that both age groups paid the same amount of attention to the story. That is, they were more or less equally able to identify both typical and atypical items that had actually been presented in their stories. Thus, the d' differences were not due to differential memory for the presented materials.

False alarm rates, on the other hand, showed significant main effects for both age ($F(1,38) = 16.89$, $p < .01$) and typicality ($F(1,38) = 205.77$, $p < .01$), and the age x typicality interaction was

highly significant ($F(1,38) = 12.60, p < .01$). Simple main effects analysis showed that the difference due to age was substantially greater in the case of the atypical items. In fact, the older children had practically no false alarms to atypical items, whereas the younger children had a false alarm rate of .43, more than 7 times higher! In essence, children of both age groups were poor at discriminating typical items, but elementary school children showed dramatically better rejection of atypical distractors than did preschoolers.

In summary, we found that both preschoolers and elementary children evidenced scripts, and that these scripts seemed to be very similar, when the results of a rating task, rather than a generation task, were considered. Both age groups showed the "typicality effect," in that while they could not discriminate typical items, recognition of atypical items was good. Our most important finding was that the typicality effect seems to get stronger with age, and its development is associated with an increasing ability to reject nonpresented atypical distractors. We interpret this to show that scripts are still undergoing some refinement as age increases. Until the boundaries of a script are well formed, a child may "try out" new information when encountering events similar to previously experienced episodes. As episodes are placed on top of a forming script, overlapped items would be considered more and more typical, while atypical items might get pushed to the edges or boundaries of the generic script. Because of this, as experience increases, recognition of atypical items would become more accurate. Script development, then, would seem to be a process of testing items for potential script

membership. The preschooler seems more willing to consider atypical items as potentially part of the generic script, whereas the elementary school child more accurately rejects unusual events as not belonging.

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Test Stories

VERSION A

There was a little boy named Jack who was a lot like you. He had a very nice family and lived in a neighborhood very much like yours. One morning, after Jack woke up, he went into the bathroom and took off his pajamas. Then he took a bath. After he was done, he ate breakfast. While he was eating, he dropped his spoon (A) and he spilled his milk. Then he made his lunch (A) to eat later at school. He watched TV and waited for the rest of the family to wake up (*). Jack played (*) for awhile. Jack's father mowed the lawn (A). Jack went back to his room and made his bed. Then he washed his face and brushed his teeth. Jack got his things ready for school. Then Jack rode the bus to school (*). continued....

VERSION B

There was a little girl named Jane who was a lot like you. She had a very nice family and lived in a neighborhood very much like yours. One morning, after Jane woke up, she got out of bed, and got dressed. She did some exercises (A). Then she went downstairs (*). She made her own breakfast and drank some juice. Then she went into the living room. She practiced the piano (A) for awhile. Then she went back to her bedroom. She tripped on the stairs (A). She cleaned her room and brushed her hair. Later she helped her mother with the dishes (*). She tried to talk her mother out of going to school (A). She then walked to the bus stop (*) and went to school. continued...

Note: items that were used on the recognition test are underlined. Items followed by (A) are atypical items and those followed by (*) are age specific. The stories continue with a grocery story episode and a restaurant episode. Typical, atypical, and age specific items, as well as story length are equated across the three episodes.

Recognition Test Results

Age Group	Typical			Atypical		
	p(HIT)	p(FA)	d'	p(HIT)	p(FA)	d'
3-5	.88	.77	0.44	.81	.43	1.05
7-9	.81	.61	0.60	.85	.06	2.56
M	.84	.69	0.52	.83	.24	1.80